

Appln. No. 10/619,299

Amendment dated: November 17, 2004

Response to Office Action dated September 23, 2004

## **REMARKS**

These remarks are in response to the Office Action dated September 23, 2004. This reply is timely filed. At the time of the Office Action, claims 1-23 were pending in the application. Claims 8-12 have been objected to for informalities. Claims 22-23 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1-3, 6, 9-10, 12, 15 and 17-23 have been rejected as being unpatentable over U.S. Patent No. 6, 462,714 to Okabe et al. (hereinafter "Okabe"). Claims 7-8, 11 and 16 were rejected under 35 U.S.C. 103(a) as being unpatentable over Okabe. Claims 4-5 and 13-14 were objected to as being dependent upon a rejected base claim, but are indicated as being allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The rejections are set out in more detail below.

### **I. Claim Objections**

Claims 8-12 were objected to for informalities. Claims 8-10 have been amended to correct the informalities. The corrections to claim 10 have provided an antecedent basis for the terms objected to in claims 11-12, and thus the terms in claims 11-12 now have a proper antecedent basis. Applicant therefore respectfully requests that the objections be withdrawn.

### **II. Claim Rejections 35 U.S.C. §112, Second Paragraph**

Claims 22-23 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claims have been amended to particularly point out and distinctly claim the subject matter. Applicant therefore respectfully requests that the rejection be withdrawn.

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Appl. No. 10/619,299

Amendment dated: November 17, 2004

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### III. Claim Rejections on the Art

Prior to addressing the Examiners rejections, a brief review of Applicant's invention is appropriate. The invention relates to a compact slotted cylinder antenna, which may be configured to have an omni-directional radiation pattern, a cardioid radiation pattern, or a hybrid of the two. The near field impedance of the antenna is significantly lower than the impedance of human tissue. Accordingly, the antenna can be operated in proximity to a human body without significant coupling between the antenna and the body. In consequence, the risk of harmful side effects on the body due to radio frequency (RF) energy propagated by the antenna is minimized.

The compact slotted cylinder antenna comprises a radiating member and an impedance matching device electrically connected to the radiating member by a conductor. The radiating member, impedance matching device and conductor can be integrally formed from a single conductive sheet. Accordingly, the antenna can be produced at low cost.

Claims 1-3, 6, 9-10, 12, 15 and 17-23 have been rejected as being unpatentable over Okabe under 35 U.S.C. § 102(b) and claims 7-8, 11 and 16 have been rejected as being unpatentable over Okabe under 35 U.S.C. § 103(a). Okabe discloses a slot antenna which can be connected to a tunable circuit. A variable impedance circuit is connected between conductors on opposite edges of the slot in a position at a constant distance from one of the ends of the slot. A control signal varies impedance of the variable impedance circuit so as to control the resonant frequency of the antenna. Notably, Okabe fails to disclose many important features of Applicant's claimed invention.

Claims 1 and 17 each recite an antenna for RF communications comprising a radiating member, and impedance matching device, and a conductor operatively connecting the radiating member to the impedance matching device. As recited in claims 1 and 17, the radiating member comprises an electrically conductive material and has a slot extending from a first portion of the radiating member to a second portion of the radiating member. Moreover, claims 1 and 17 recite that the radiating member is substantially tubular and defines a cavity therein.

{00003172;}

Appin. No. 10/619,299  
Amendment dated: November 17, 2004  
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Okabe fails to disclose a conductor operatively connecting the radiating member to the impedance matching device. The Examiner has suggested that Okabe's power supply conductor (5) meets this limitation. Applicant respectfully disagrees. Specifically, Okabe's power supply conductor (5) does not connect an impedance matching device to a radiating member as recited in claims 1 and 17. Instead, Okabe's power supply conductor connects a matching conductor (4) to a first island conductor (6).

The first island conductor (6) is not equivalent to the claimed radiating member. The first island conductor (6) is described by Okabe as follows: "...in which a radio frequency power supply circuit 7 supplies radio frequency power through a power supply conductor 5 and an island conductor 6 between a connection portion 41 set in the strip conductor 40 and the wall surface of the conductive cubic 1." Col. 1, line 66 – Col. 2, line 3. Moreover, at Col. 3, lines 55-60 Okabe states "one end of the power supply conductor is connected to the first island conductor, so as to supply AC power through the first island conductor between one end of the power supply conductor and the conductor of the lower surface of the conductive cubic."

In contrast to the claimed radiating member, Okabe's first island conductor (6) does not have a slot extending from a first portion of the island conductor to a second portion of the island conductor. Moreover, Okabe's first island conductor (6) is not substantially tubular and does not define a cavity therein. Accordingly, Okabe's power supply conductor (5) does not connect the claimed impedance matching device to the claimed radiating member, and thus is not equivalent to the claimed conductor which operatively connects the radiating member to the impedance matching device as recited in claims 1 and 17.

Claim 10 also recites an RF communications antenna comprising the radiating member, non-conductive slot and impedance matching device as claimed in claim 17. However, claim 10 further recites that the absolute value of the field impedance associated with the antenna is substantially less than 50 ohms. Similarly, claims 8 and 11 recite that the field impedance is less than  $0 \pm 2j$  ohms and claims 9 and 12 claim that the field impedance is less than 5 ohms. These limitations are not disclosed in

{00003172;}

Appln. No. 10/619,299

Amendment dated: November 17, 2004

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Okabe.

The Examiner has suggested that Okabe discloses these limitations because Okabe discloses a variable impedance circuit (10) which can be more or less than 5 ohms. Notwithstanding that Okabe wholly fails to disclose that his variable impedance circuit can be more or less than 5 ohms, Applicant believes that the Examiner has misunderstood the difference between the impedance presented by an impedance circuit and the field impedance associated with an antenna. An impedance matching circuit typically is inserted between a source and a load. The impedance matching circuit presents a load impedance to a signal source, while presenting a source impedance to the load which is different than the load impedance it presents. As described by Applicant in paragraph 46 of the specification, the field impedance of the antenna is given by the equation  $Z = E/H$ , where E is the E-field component of a signal being propagated by the antenna and H is the H-field component of a signal being propagated by the antenna. Hence, the impedance of Okabe's impedance matching circuit is distinctly different than field impedance. Accordingly, Okabe fails to teach or suggest an antenna where the absolute value of the field impedance associated with the antenna is substantially less than 50 ohms, less than  $0 \pm 2j$  ohms, or less than 5 ohms. Accordingly, Okabe fails to disclose the field impedance limitations recited in claims 8-12.

It also should be noted that the basic requirements of a *prima facie* case of obviousness for the impedance values claimed in claims 8 and 11 has not been met. "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations." MPEP § 2143. Okabe provides no suggestion or motivation that such field impedances are desirable. Additionally, such suggestion or motivation is not known generally to those skilled in the art. As evidence of this fact, at the time the invention was made, there were no antennas available for

{00003172;}

Appl. No. 10/619,299

Amendment dated: November 17, 2004

Response to Office Action dated September 23, 2004

use near the human body which generated the claimed low field impedances.

Claims 3 and 20 recite that the radiating member and the impedance matching device have a common cross sectional profile. Okabe wholly fails to disclose this limitation. The Examiner appears to be attempting to equate Okabe's first island conductor (6) with the claimed radiating member, and equate Okabe's matching conductor (4) with the claimed impedance matching device. Notwithstanding that, the first island conductor (6) is not equivalent to the claimed radiating member, as noted, Okabe's first island conductor (6) and matching conductor (4) do not have the same cross sectional profile. As shown in Figs. 1 and 3-13, the matching conductor (4) does not extend to the edge of the conductive cubit whereas the first island conductor (6) does. Moreover, there is no indication that the matching conductor (4) and the first island conductor (6) have any dimensions that are the same.

Claims 6 and 15 each recite that the impedance matching device is connected to the second portion of the radiating member. In order to assert this rejection the Examiner has equated Okabe's slot extension portion (3) to the claimed impedance matching device. However, the slot extension portion wholly fails to meet the limitations of the radiating member as recited in claim 1. Accordingly, Okabe fails to disclose the limitation recited in claims 6 and 15.

Claim 21 recites that the antenna of claim 1 further comprises an electrostatic shield member having an axial slot extending from a first end of the electrostatic shield member to a second end of the electrostatic shield member. Okabe fails to disclose this limitation. Specifically, Okabe's shield conductive wall (101), which the examiner correlates to the claimed electrostatic shield member, does not have an axial slot. Instead, the shield conductive wall (101) has drill holes, which are distinct from a slot.

Claims 7 and 16 each recite that the claimed antenna comprises a transverse electromagnetic (TEM) feed coupler. The Examiner has asserted that a TEM feed coupler would have been an obvious design choice. As noted, in order to establish a *prima facie* case of obviousness, there must be some teaching or suggestion in Okabe to implement the TEM feed coupler. MPEP § 2143. Again, Okabe has not provided any such teaching or suggestion.

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Appln. No. 10/619,299  
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IV. Allowable Subject Matter

Claims 4-5 and 13-14 were objected to as being dependent upon a rejected base claim, but are indicated as being allowable if rewritten in Independent form including all of the limitations of the base claim and any intervening claims. However, Applicant believes that the base claims are now in condition for allowance, and thus renders the objections moot.

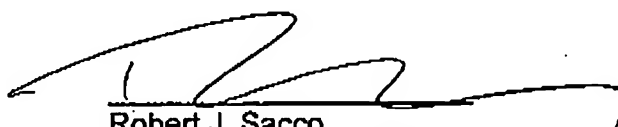
V. Conclusion

It is believed that all claims are in condition for allowance. Nevertheless, Applicant invites the Examiner to call the undersigned if it is believed that a telephonic interview would expedite the prosecution of the application to an allowance. In view of the foregoing remarks, Applicant respectfully requests reconsideration and prompt allowance of the pending claims.

Although no fee is believed due, the Commissioner is hereby authorized to charge any fees which may be due by submission of this document to Deposit Account No. 50-2884.

Respectfully submitted,

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Date



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